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IS 7611 (1993): Internal Combustion Engines - Radiators
[TED 2: Automotive Primemovers]

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(पहला पुनरीक्षण)

Indian Standard

INTERNAL COMBUSTION ENGINES — RADIATORS — SPECIFICATION

(First Revision)

UDC 621·43 : 629·113

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1993

Price Group 4

Automotive Primemovers Sectional Committee, TED 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Primemovers Sectional Committee had been approved by the Transport Engineering Division Council.

This Indian Standard was first published in 1976. In this revision the material requirements have been rationalized and the tests have been classified for type and production conformity approvals. New tests like leakage tests for filler neck seating, pressure impulse, internal cleanliness have been included. A separate standard IS 13687 : 1993 covering heat dissipation performance of radiators has been prepared. This standard is also an important adjunct to IS 13686 : 1993 'Internal combustion engines — Radiators — Methods of test'.

While preparing this standard, assistance has been derived from the following publications:

CSN 302620 : 1961 'Water radiators, dimensions', issued by Czechoslovakia. [Ceskoslovenska Statni Norma]

DIN 71550 : 1954 'Beading for inlet and outlet pipe of indicators', issued by Deutscher Normenausschass.

SAE J 164 : 1982 'Radiator caps and filler necks', issued by Society of Automotive Engineers, USA.

SAE J 631 : 1982 'Radiator nomenclature', issued by Society of Automotive Engineers, USA.

SAE J 868 : 1982 'Large size radiator filler necks', issued by Society of Automotive Engineers, USA.

For the purpose of deciding whether a particular requirements of this standard is complied, with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INTERNAL COMBUSTION ENGINES — RADIATORS — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This Indian Standard specifies the type, material, performance requirements for radiators used in automotive vehicles. It also covers wherever applicable, radiators for off-highway vehicles including tractors.

1.2 It does not include radiators for cooling oil such as in transmission unit and engine lube oil.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
193 : 1982	Soft solder (*fourth revision*)
407 : 1981	Brass tubes for general purposes (*third revision*)
410 : 1977	Cold rolled brass sheet, strip and foil (*third revision*)
513 : 1986	Cold rolled low carbon steel sheets and strips (*third revision*)
554 : 1985	Dimensions for pipe threads where pressure tight joints are required on the threads (*third revision*)
1079 : 1988	Hot rolled carbon steel sheet and strip (*fourth revision*)
2500 (Part 1) : 1973	Sampling inspection tables: Part 1 Inspection by attributes and by count of defects (*first revision*)
3331 : 1971	Copper and brass strips/foils for radiator cores (*first revision*)
13586 : 1993	Internal combustion engines — Radiators — Methods of test
13687 : 1993	Internal combustion engines — Radiators — Methods of test for heat dissipation performance

3 TYPES

3.1 Sheet metal type of radiators shall be as per Fig. 1 and 2. Figure 3 is applicable for bolted type. The cast or fabricated types are indicated in Fig. 4, 5 and 6. Tube and fin types are shown in Fig. 7, 8 and 9.

4 MATERIAL

4.1 The material for the radiators and their components shall comply with the following:

Component	*Conforming to*
Core	IS 3331 : 1977
Headers, filler neck, pressure cap, etc	IS 410 : 1977
Steel sheets	IS 1079 : 1988 or IS 513 : 1986
Tubes	IS 407 : 1981

5 DIMENSIONS

5.1 The dimensions of filler necks, for small and medium sizes shall be as given in Table 1 and for larger size as shown in Fig. 10. The radiator dimensions shall be as specified. The threads for drain cock shall be in accordance with IS 554 : 1985. The dimensions of pipes for water inlet and outlet shall conform to Table 2.

6 WORKMANSHIP AND FINISH

6.1 The solder used for fabrication shall conform to IS 193 : 1982. The steel components shall be solder dipped or made out of tin or laed coated solder sheets to prevent corrosion. The radiator shall be free from dents, breakages or cracks. Joints in core, inlet and outlet shall be properly soldered and shall be free from any manufacturing defects, like discontinuities, cracks. The filler necks shall be finished smooth both from inside and outside. The radiators may also be painted when agreed between the manufacturers and the purchasers.

7 TESTS

7.1 The following shall constitute the type tests for acceptance purposes. These tests shall also be carried out when any major modifications on

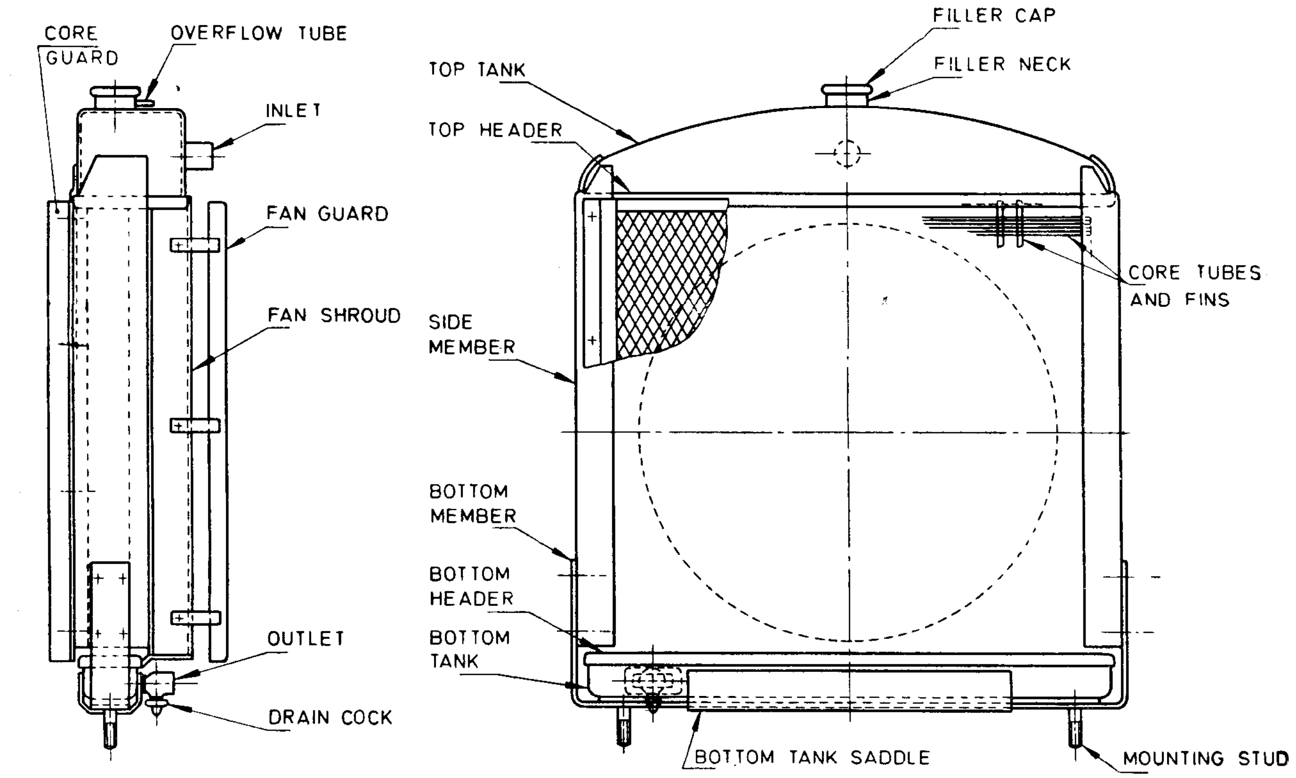


FIG. 1 SHEET METAL RADIATOR

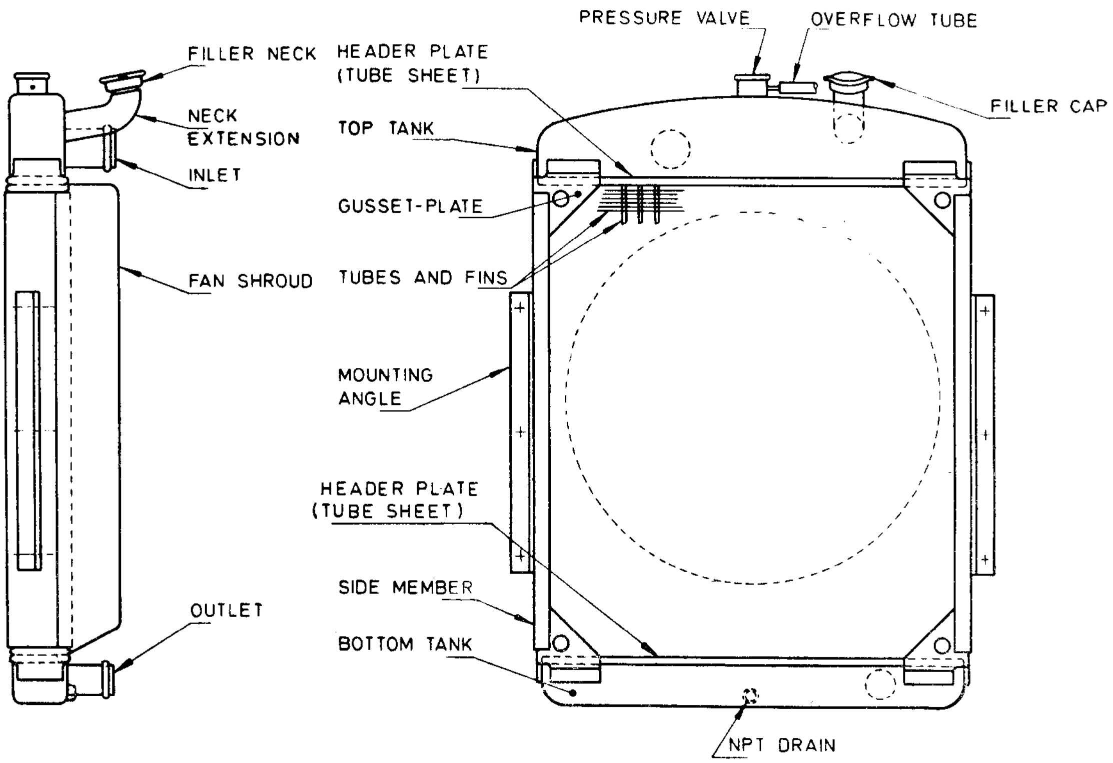


FIG. 2 SHEET METAL RADIATOR

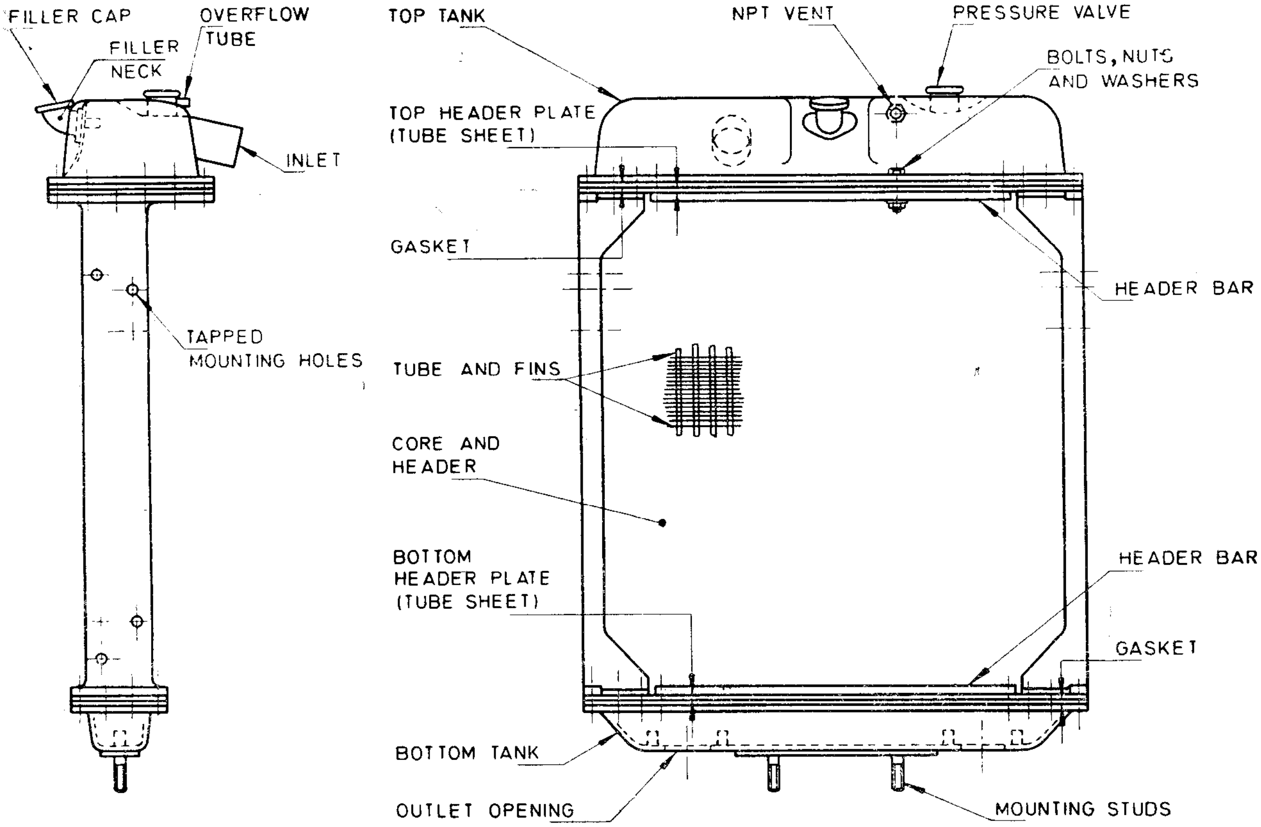


FIG. 3 BOLTED TYPE RADIATOR, DRAWN TANKS

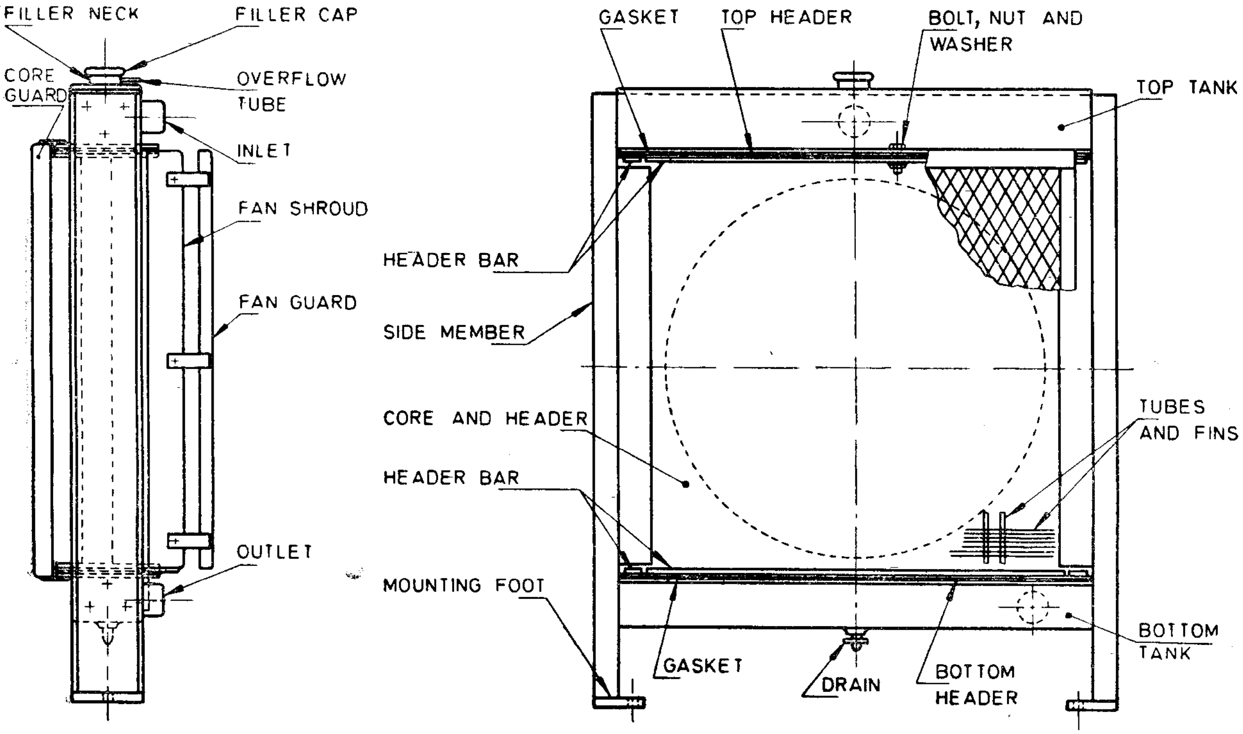


FIG. 4 CAST OR FABRICATED RADIATOR (ONE PIECE CORE)

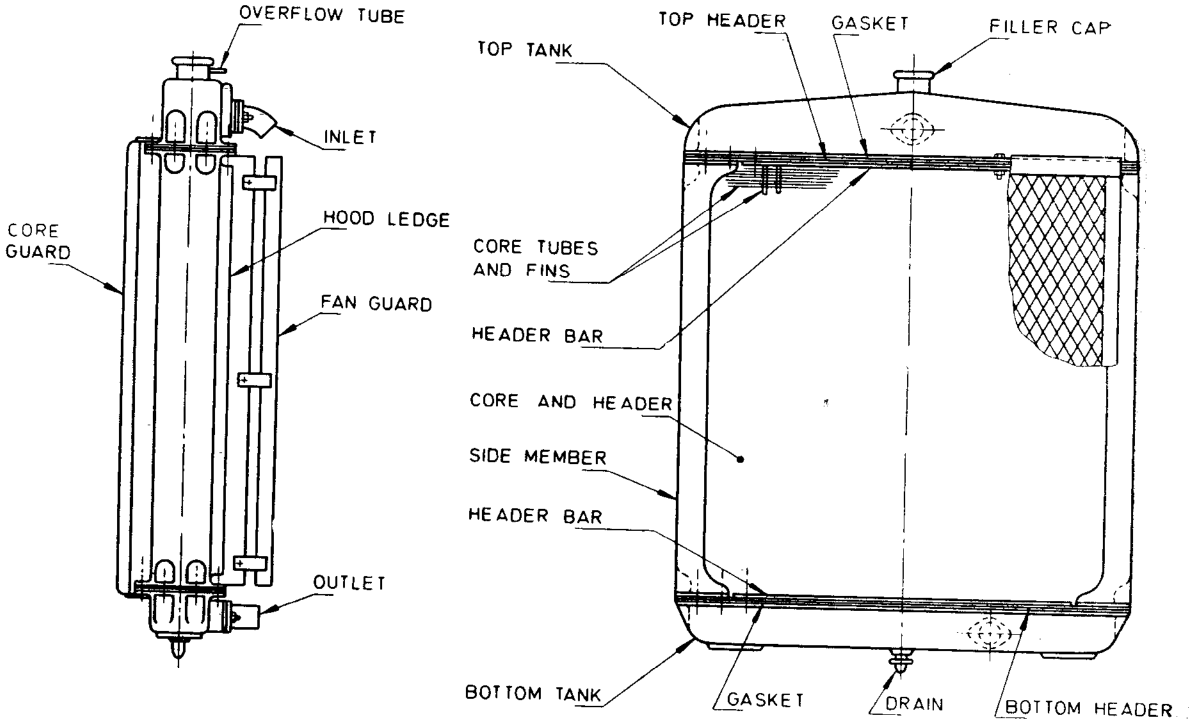


FIG. 5 CAST OR FABRICATED RADIATOR (ONE PIECE CORE)

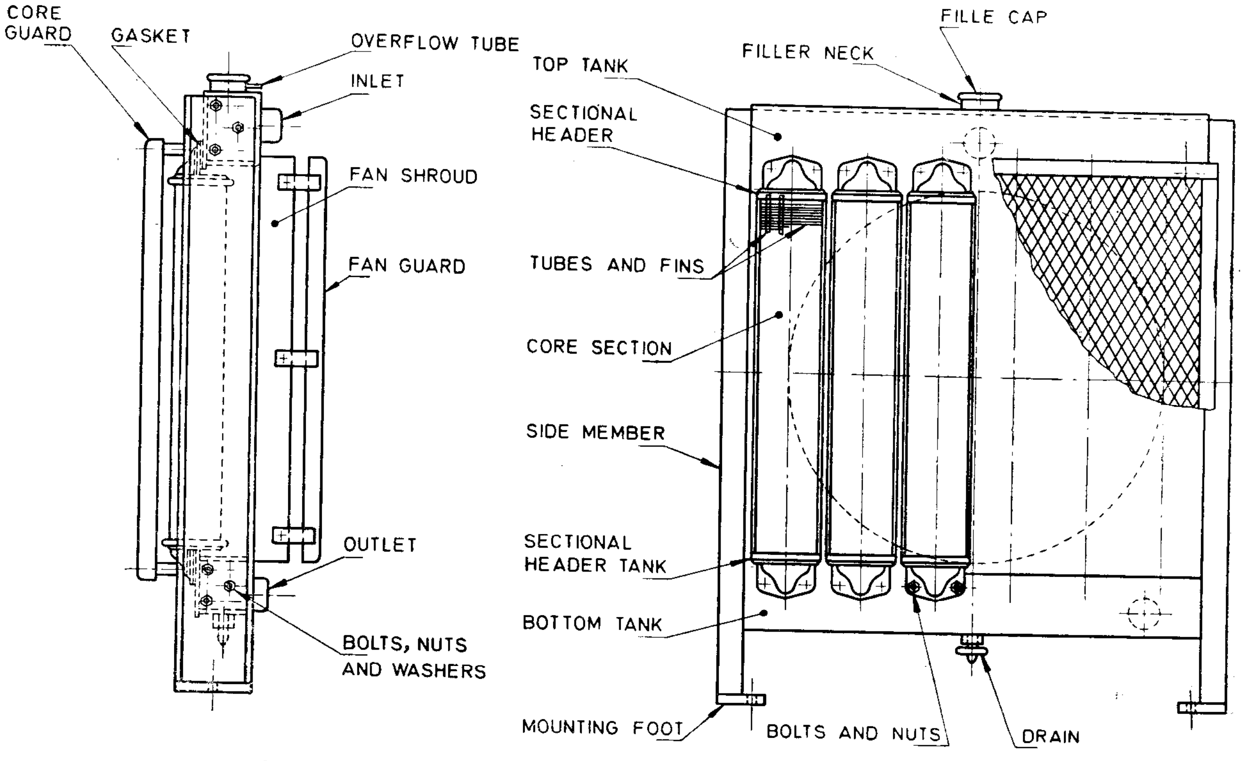


FIG. 6 CAST OR FABRICATED RADIATOR (SECTIONAL)

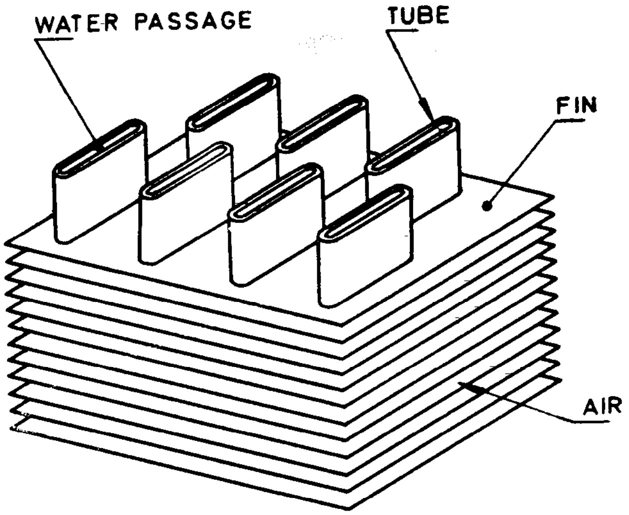


FIG. 7 TUBE AND PLATE FIN CORE

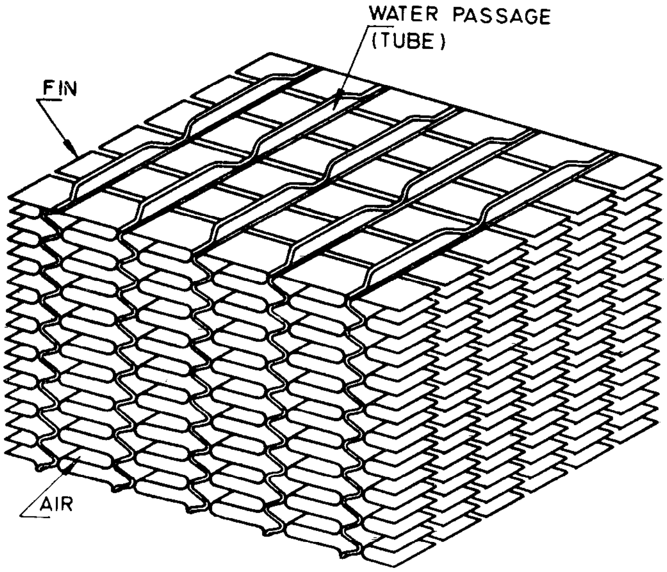


FIG. 8 RIBBON CELLULAR CORE

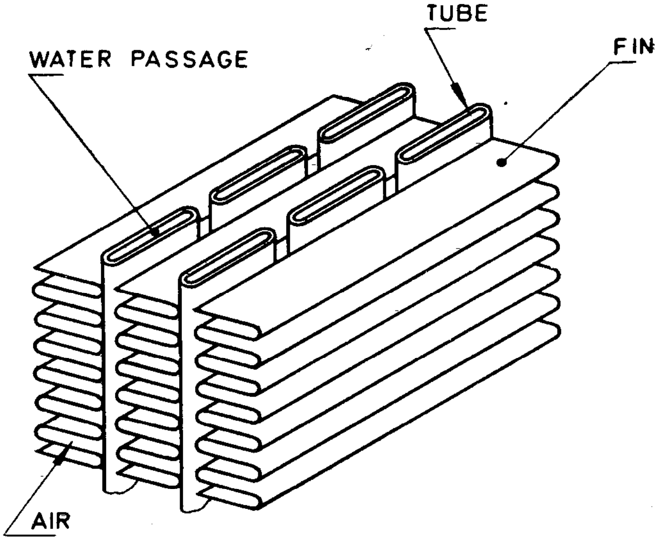
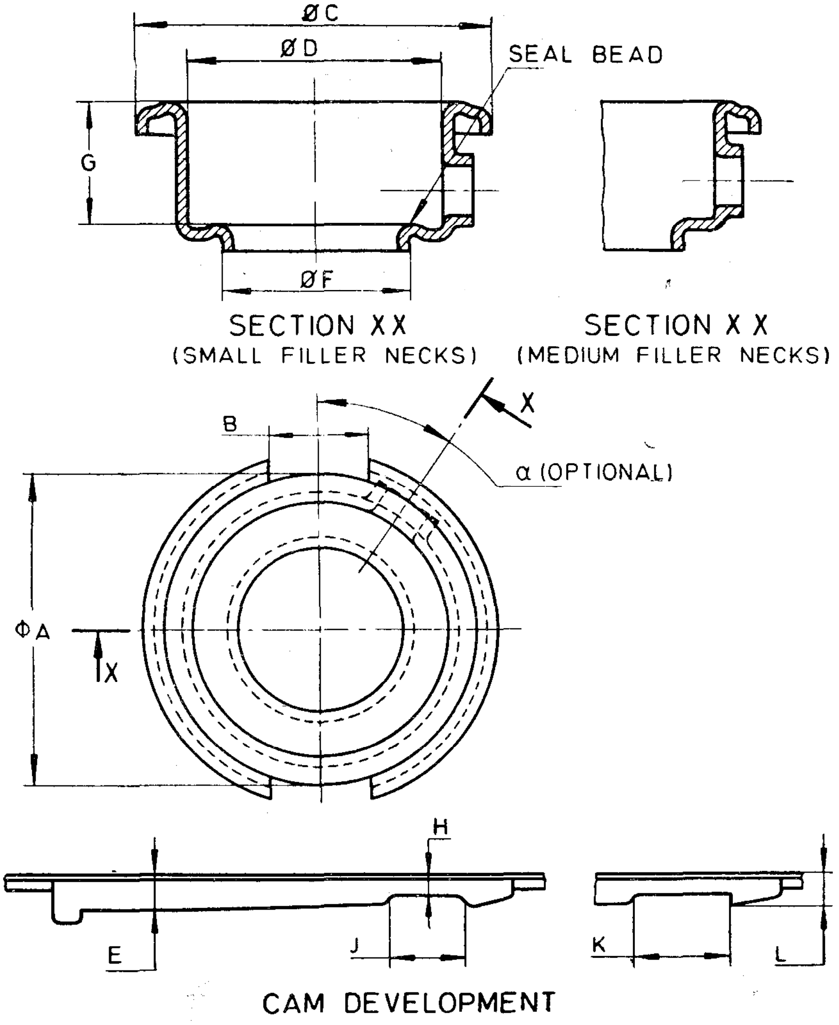


FIG. 9 TUBE AND CORRUGATED FIN CORE

Table 1 Dimensions for Small and Medium Size Radiator Filler Necks

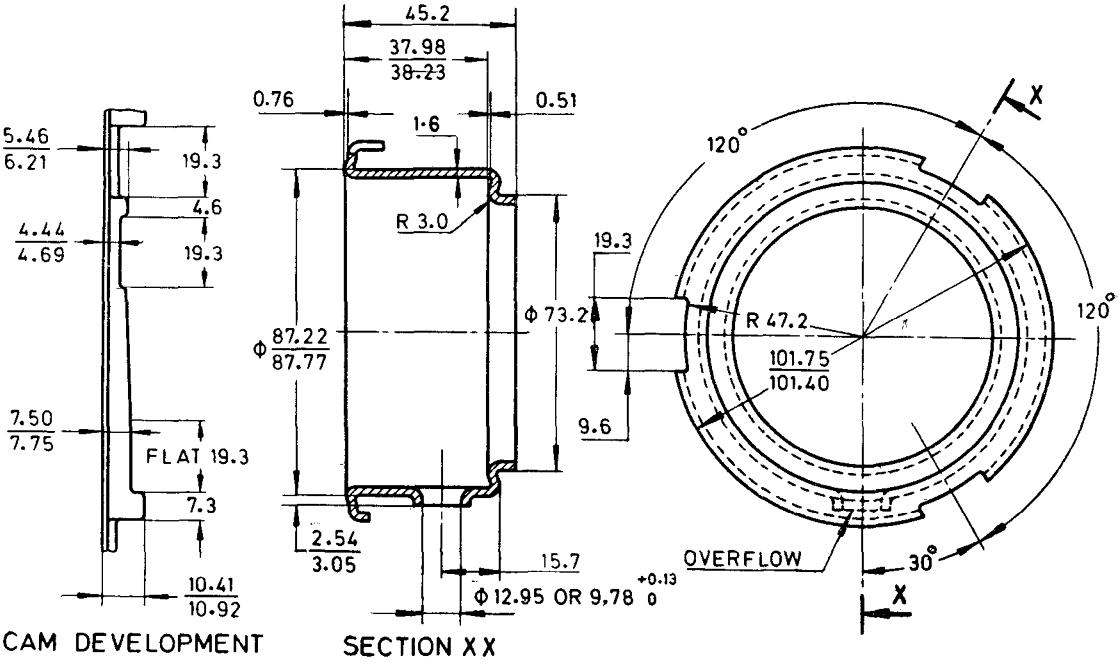
(*Clause* 5.1)



All dimensions in millimetres.

Neck Size	Material Thickness	Nominal Pressure Rating kPa (kgf/cm²)	*A* ±0·25	*B* ±0·50	*C* +0·13 −0·25	*D* +0·13 −0·25	*E* ±0·13	*F* ±0·13	*G* ±0·13	*H* ±0·13	*J* *Min*	*K* *Min*	*L* ±0·1
Small	1	0-35 (0-0·35)	50	12·5	57	41	5·6	30	19·5	3·3	12·5	12·5	5
	1	35-55 (0·35-0·55)	50	15·8	57	41	5·6	30	19·5	3·3	12·5	15·8	5
	1	80-110 (0·80-1·10)	50	22·5	57	41	5·6	30	19·5	3·3	—	22·5	5
Medium	1	0-35 (0-0·35)	62	13·2	68·5	54	5·6	42·5	18·8	3·3	—	12·5	5
	1	35-55 (0·35-0·55)	62	18·8	68·5	54	5·6	42·5	18·8	3·3	—	17	5

NOTE — Square safety stop and dimensions *K* and *L* are recommended.

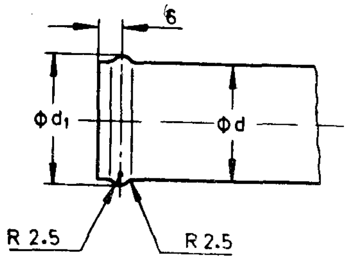


All dimensions in millimetres.

FIG. 10 DIMENSIONS FOR LARGE SIZE RADIATOR FILLER NECK

Table 2 Dimensions of Water Inlet and Outlet Pipes

(*Clause* 5.1)



All dimensions in millimetres.

d_1+0·5	27	32·5	40	47	53	58	63
d	25	31·5	38	45	50	55	60

NOTE — These are preferred dimensions. Pipes of dimensions other than these can be used when agreed between manufacturer and purchaser.

approved types are carried out:

a) Pressure test

b) Leakage test for filler neck

c) Internal cleanliness test

d) Heat transfer performance

e) Pressure impulse

f) Vibration

g) Resistance to paint (only for painted radiators)

7.2 Routine Tests

7.2.1 The following tests shall be carried out on each radiator:

a) Pressure tests; and

b) Leakage test for filler neck.

7.3 Acceptance Tests

7.3.1 The following tests shall constitute tests for the purpose of acceptance and shall be carried out on sampling basis:

a) Dimensions, and

b) Internal cleanliness.

7.4 Pressure Test

7.4.1 When tested in accordance with **3.6** of IS 13686 : 1993 the radiator shall be free from any leakage.

7.5 Leakage Test for Filler Neck Seat

7.5.1 The radiator shall comply with **3.7** of IS 13686 : 1993.

7.6 Internal Cleanliness Test

7.6.1 The test shall be carried out in accordance with **3.8** of IS 13686 : 1993.

7.7 Heat Transfer Performance

7.7.1 The test shall be carried out as outlined in IS 13687 : 1993. The performance shall be within ± 10 percent of the value recommended by the manufacturer.

7.8 Pressure Impulse Test

7.8.1 The test shall comply with requirements given in **3.10** of IS 13686 : 1993.

7.9 Vibration Test

7.9.1 When tested in accordance with **3.11** of IS 13686 : 1993, leakage, drop in pressure crack in mountings or any noticeable failure shall not be permitted.

7.10 Resistance to Paint (Only for Painted Radiators)

7.10.1 The test shall comply with requirements given in **3.13** of IS 13686 : 1993.

7.11 Optional Tests

7.11.1 The following tests shall constitute optional tests and they shall be carried out if agreed between manufacturer and purchaser:

a) Test on engine dynamometer.

b) Vehicle testing on road.

8 MARKING

8.1 Each radiator shall be legibly and indelibly marked with indication of source of manufacture, month and year of manufacture and any other markings required such as part number, volumetric capacity.

9 PACKING

9.1 The packing shall be as per agreement between the purchaser and the manufacturer. Care shall be taken to prevent damage in transit particularly to the core.

10 SAMPLING

10.1 Lot

In a consignment all the radiators of the same type and size manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

10.2 Unless otherwise agreed to between the supplier and the purchaser, the procedure as given in IS 2500 (Part 1) : 1973 shall be followed for sampling inspection. The inspection level, acceptable quality level (AQL) and type of sampling plan to be followed for various characteristics shall be given in **9.2.1** and **9.2.2** of IS 2500 (Part 1) : 1973.

10.2.1 For dimensions, workmanship, finish and internal cleanliness, a single sampling plan with inspection level IV and AQL of 1·5% as given in Tables 1 and 2 of IS 2500 (Part 1) : 1973 shall be followed.

11 INFORMATION ON ENQUIRY/SUPPLY

A typical format is given below:

a) Indication of the source of manufacture.
b) Details of engine:
    i) Rating, kW;
    ii) Speed at full load, rpm;
    iii) Type of coolant, flow rate;
    iv) Details of fan, if any, including flow characteristics; and
    v) Rate of heat to be dissipated.
c) Site conditions (where radiator is expected to function). Ambient temperature K, percentage humidity.
d) Over all dimensions.
e) Maximum temperature of engine outlet water at:
    i) Specified ambient conditions,
    ii) Specified water flow, and
    iii) Specified air flow.
f) Heat transfer performance curves.
g) Vibration characteristics of mountings and type of mounting } Amplitude.... Frequency.... Duration......
h) Any other auxiliary fittings (condenser, oil coolers, etc).
j) Location of any other heat exchangers with reference to radiator.
k) Any other parameteer/special requirements.

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